

MK 39 MOD 3A Ring Laser

Ship's Inertial Navigation System



Sperry Marine



Image Courtesy of the United States Navy



Elmer Sperry

The MK39 Ring Laser Gyro - Navigator Story

Elmer Sperry patented the first gyrocompass designed expressly for the marine environment in 1910. This “spinning wheel” gyro was a significant improvement over the traditional magnetic compass of the day and changed the course of Naval History. The first Sperry gyrocompass was tested at-sea aboard the USS Delaware in 1911 and established Sperry as a world leader in the manufacture of military gyrocompasses for the next 80 years.

Sperry Marine introduced Ring Laser Gyro (RLG) technology to the world of ships and submarines in 1990 and in just a few short years the RLG replaced the “spinning wheel” for all precision navigation applications world-wide. Today the Sperry MK49 is the standard RLG Ship’s Inertial Navigation System for NATO ships and submarines, the

AN/WSN-7 RLGN is the next generation navigator for all U.S. Navy submarines, aircraft carriers and other surface ships, and the Mk 39 RLG system has been selected by more than two dozen international navies, the U.S. Military Sealift Command, and the U.S. Coast Guard for applications to many different surface ship platforms. More than 80% of all RLG navigation systems operational in navies today carry the Sperry name.

Sperry Marine is now producing our third generation Ring Laser Gyro Inertial Navigation System-the Mk 39 MOD 3A. The MK 39 MOD 3A provides both high accuracy geographic position information, with or without GPS, and precise attitude and heading data needed for fire control stabilization and weapons initialization. The MK39 MOD

3A occupies 36% less deck space than our previous models, utilizes enhanced Digital Ring Laser Gyro technology, and is certified for submarine applications due to its extremely low noise signature.

The Mk 39 MOD 3A, like all previous Sperry gyrocompass and navigation systems, is designed and built with the experience and integrity that is only found in a company with over 90 years of dedication to the marine ship and submarine market.



MK 39 MOD 3A Ring Laser Ship's Inertial Navigation System

Benefits of Use:

- Low acquisition and through-life cycle cost
- High reliability, low maintenance
- No practical limitations on rate of attitude changes- can be used on virtually any hull type
- Hands off operation, does not require operator intervention
- Provides data at stated accuracies through severe shock events
- Easy to maintain with access to all internal assemblies and LRUs
- Can be monitored via existing combat system data bus
- DC operation eliminates additional converters and UPS
- Automatic fault isolation and system protection for critical failure modes eases troubleshooting and protects unit
- Not affected by rapid changes in external magnetic fields, assuring high accuracy regardless of location
- Replacement of MK 39 can be done at sea with no further alignment required



Significant Features

- RLG sensor with proven MTBF in excess of 200,000 hours
- No moving parts
- Full built-in test capability
- Self-aligning at startup
- Automatic transition from align to operate mode
- Full accuracy attitude operation within 10 minutes at dockside or 30 minutes at sea
- Extremely high dynamic stability
- Digital and synchro interfaces
- Small size and weight
- 24 - 28 volt DC operation
- Vessel speed up to 90 knots
- MTTR of 30 minutes or less
- Completely enclosed assembly - no fans or heaters required
- Very high immunity to magnetic fields
- At sea replaceable IMU
- Remote Control Display Unit (RCDU) included
- Low noise for submarine application

Expansion Paths

- Slaved operation with other systems including fast align for inertial positioning system
- Distributed vertical reference configuration

Applications

- Precise Weapons stabilization
- Automated aircraft landing system stabilization
- Ship's Inertial Navigation System
- Rapid alignment system for Inertial Navigation
- Radar and Fire Control stabilization
- Critical sensor stability
- Heading and Attitude information for high speed Surface Effect and Hovercraft applications



Specifications

PERFORMANCE:

Accuracy

Heading:	3 Arcmin Sec (Lat) RMS
	7 Arcmin Sec (Lat) Peak
Roll, Pitch:	1.7 Arcmin RMS
	3 Arcmin Peak
Velocity:	0.6 kts RMS
Position:	1.0 nm in 8 hr TRMS

Dynamic Motion

Roll:	±40 Deg
Pitch:	±15 Deg
Yaw:	±10 Deg
Speed:	-10 to 90 Knots

Dynamic Stability

R/P:	0.001 deg/sec
Heading:	0.003 deg/sec

Setting Times

	10 minutes dockside (full accuracy)
	30 minutes at sea (full accuracy)

SYSTEM OUTPUTS:

Analog:

Roll and Pitch:	1X and 36X or 2X and 36X
Heading:	1X and 36X

Digital:

	Roll, Pitch, Heading, Attitude rates (roll, pitch, heading), system status via RS232/422 serial data interface
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ENVIRONMENTAL CONDITIONS:

Temperature

Operating:	0° to 55° C (32° to 131° F)
Storage:	-40° to 70° C (-40° to 158° F)
Humidity:	95% Relative

Shock

	Meets and exceeds MIL-STD-810F
	22 g 1/2 sine wave at 11 msec, and
	50 g 1/2 sine wave at 5 msec, operating

Vibration

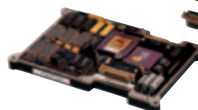
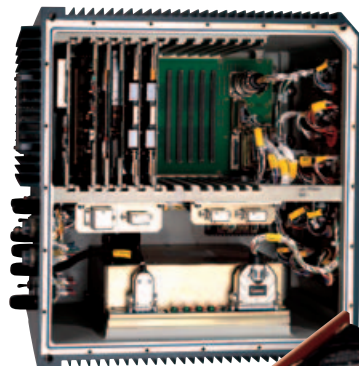
	MIL-STD-167-1 for type 1 equipment
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EMI/RFI

	MIL-STD-461-D
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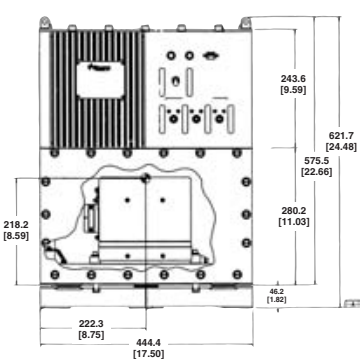
Magnetic Immunity

	5 Gauss Operation
	30 Gauss Storage

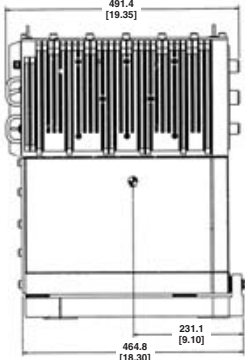


Ring Laser Gyro

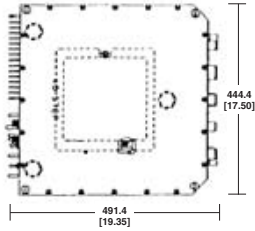
Dimensions



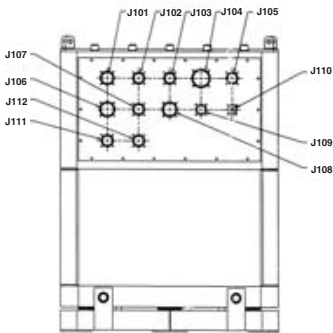
Front



Side



Top

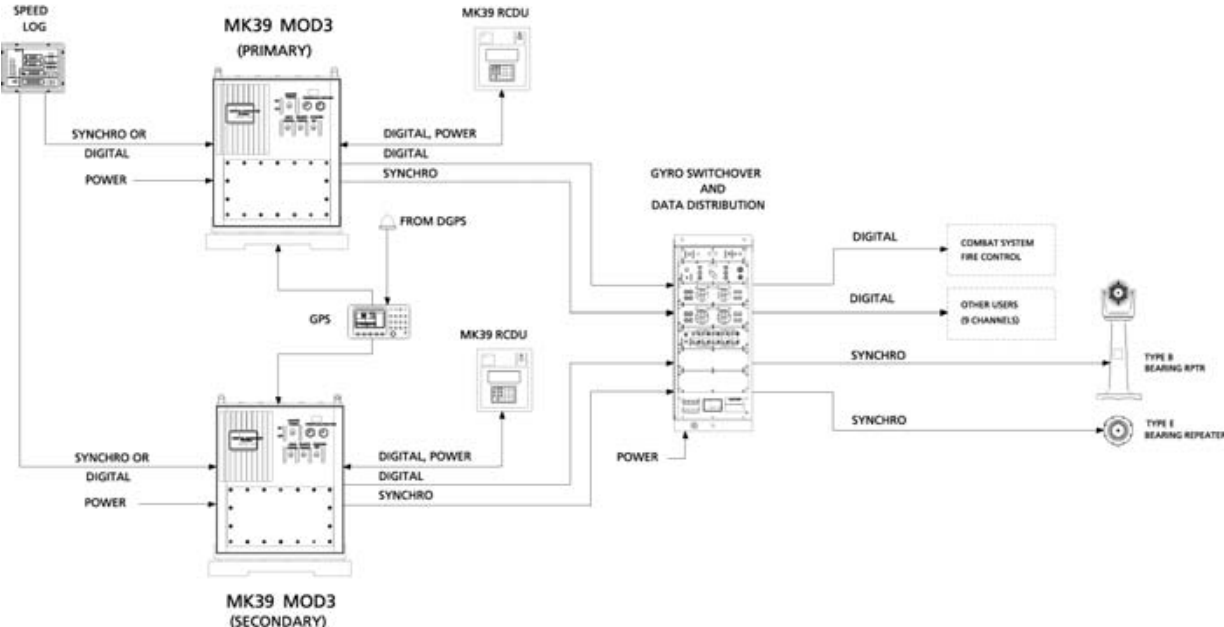


Back

REAR PANEL I/O CONNECTORS

REF DES	FUNCTION
J101	SHIP'S +28VDC
J102	SHIP'S 115VAC SYNCHRO REF
J103	ANNUNCIATOR
J104	ALARM RELAYS
J105	USERS INTERFACE #1
J106	REMOTE PANEL/FIM
J107	SPEED LOG
J108	SYNCHRO H.R.P.
J109	AC/UPS BIT
J110	RESERVED
J111	USER INTERFACE #2
J112	USER INTERFACE #3

Typical MK 39 Block Diagram



Sperry Marine

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Worldwide Service

Sperry Marine, founded in 1910, is the world leader in developing, manufacturing, and supplying marine electronic equipment and systems. We have 34 facilities in 11 countries and a worldwide network of over 200 distributors. Sperry Marine has a service location in every major seaport. You are never far from a factory-trained service engineer.



At Your Service Around The World

Service Highlights:

- Worldwide 7 Days/24 Hour Service
- 24 Hour Hotline
- Computerized Customer Support
- Operator Crew and Technical Training
- Service Management Agreements/Contracts
- Electronic Documentation
- Computer-Based Training
- ISO 9002 Certified Offices
- Consultation for Special Projects
- Shoreside Repair Centers
- Parts Exchange Service
- GMDSS Shore-Based Maintenance Agreements

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